PHOTOVOLTAICS Facts:

QUESTIONS

1. To provide all the electricity used in the entire United States, we would have to install a lot of PV modules. How much land would this take up?
   a. About the entire state of Texas.
   b. About the entire state of Colorado.
   c. About the same area as is covered by our nation's roadways.
   d. About one-fourth the area covered by our nation's roadways.

2. How much electricity did PV systems generate in 1995?
   a. About 10 million kilowatt-hours.
   b. About 100 million kilowatt-hours.
   c. Nearly 800 million kilowatt-hours.
   d. More than 800 million kilowatt-hours.

3. If you took the PV systems installed just since 1988, about how many U.S homes could they power together?
   a. 10,000 homes.
   b. 75,000 homes.
   c. 150,000 homes.
   d. One million homes.

4. This same amount of electricity could power about how many homes in the developing world?
   a. The same number of homes.
   b. Two million homes.
   c. Five million homes.
   d. Eight million homes.

5. Even today, PV power makes an ideal supplement to utility power. What is the main reason for this?
   a. PV power is cheaper than the power the utility can produce by burning coal.
   b. PV power is good for the planet.
   c. PV power correlates well with the utilities' daily load patterns, because the power is available when it is needed most--during daylight hours.
   d. Most utility plants are located in sunny areas.

6. About how many U.S. companies are producing PV panels today?
   a. 5
   b. 10
   c. 20
   d. 50

7. The most frequently seen application of PV is in consumer products, which use tiny amounts of direct current (dc) power, less than 1 watt (W). How many hand-held calculators and wrist-watches are powered by PV cells?
   a. About two million.
   b. About one hundred million.
   c. More than a billion.
   d. About a zillion.

8. Why are more and more people choosing PV for remote power applications of 100 W or less?
   a. PV is often cheaper than extending a utility connection to a remote location.
   b. PV panels are dangerous, so they must be placed in remote locations.
   c. PV only works when it can be located close to where the electricity is used.
   d. Solar panels look cool sitting off by themselves.

9. How many homes worldwide depend on PV to supply all of their electricity?
   a. More than 1000.
   b. More than 100,000.
   c. More than 200,000.
   d. More than a million.

10. Of all the PV modules sold around the world today, who is selling the most?
    a. Japan
    b. Europe
    c. United States
    d. China

11. Many materials are currently used to make PV modules. Of these, which is the most common material used in PV modules today?
    a. Crystalline silicon.
    b. Polycrystalline silicon.
    c. Amorphous silicon.
    d. Cadmium telluride.

12. The cost of larger PV systems (greater than 1 kilowatt) is measured in "levelized" cost per kilowatt-hour (kWh). This means that the costs are spread out over the lifetime of the system and are then divided by the power output. The levelized cost for PV is now about 25¢ to 50¢ per kWh. At this price, PV is cost effective (competitive with other sources of electricity) for residential customers located further away from the nearest utility line. How far away do these customers have to be for this to be true?
    a. One quarter of a mile.
    b. One mile
    c. Five miles.
    d. Ten miles.

13. In 1975, the PV industry sold $2 million worth of products worldwide. Approximately what were the total sales in 1993?
    a. $10 million
    b. $50 million.
    c. $100 million
    d. More than $750 million.

14. A large number of U.S. PV modules are exported to foreign countries. In 1994, approximately what portion of the PV modules produced in the United States were exported?
    a. About 25%
    b. Nearly 50%
    c. More than 75%
    d. 100%

15. These exported modules were sold mostly in developing countries, where many people live without electricity. About how many people worldwide still live without any electricity?
    a. Nearly 5 million people.
    b. Nearly 100 million people.
    c. Nearly 1 billion people.
    d. About 2 billion people.

National Center for Photovoltaics

PHOTOVOLTAICS Facts:

ANSWERS

1. d: *PV modules covering 0.3% of the land in the United States, one-fourth the land occupied by roadways, could supply all the electricity consumed here.*

2. d: *In 1995, PV systems generated more than 800 million kilowatt-hours of electricity.*

3. c: *The PV systems installed since 1988 provide enough electricity to power 150,000 homes in the United States or 8 million homes in the developing world.*

4. d: *(see above)*

5. c: *PV-generated power correlates well with utilities' daily load patterns, because the power is available when it is needed most--during daylight hours.*

6. c: *The combined efforts of industry and the Department of Energy have reduced PV system costs by more than 300% since 1982. The PV market is estimated to be growing at 20% per year today. The number of U.S. companies producing PV panels has doubled since the late 1970s to about 20 today.*

7. c: *More than 1 billion hand-held calculators, several million watches, and a couple of million portable lights and battery chargers are all powered by PV cells.*

8. a: *Because of the high cost of connecting to a utility line and running power lines above or under ground, the PV option is often cheaper than this conventional solution.*

9. c: *More than 200,000 homes worldwide depend on PV to supply all of their electricity. Most of these systems are rated at about 1 kW and often supply alternating current (ac) power.*

10. c: *PV module production for terrestrial (non-space) use has increased 500-fold in the past 20 years. Worldwide PV module shipments in 1993 were 60 megawatts (MW). The United States now shares more than 1/3 of this market (the largest share).*

11. a: *Worldwide production of PV modules includes 48% single-crystal silicon, 30% polycrystalline silicon, and 20% amorphous silicon (mostly used in consumer products). Modules based on cadmium telluride are just now entering the consumer market.*

12. a: *The levelized cost for PV is now about 25¢ to 50¢/kWh. At this price, PV is cost effective for residential customers located at least a quarter of a mile from the nearest utility line. Reliability and lifetime are steadily improving, as well. PV manufacturers guarantee their products for up to 20 years.*

13. d: *The worldwide PV industry has grown from sales of less than $2 million in 1975 to greater than $750 million in 1993. The companies with the largest increases in sales in the 1990s have been U.S. companies, reflecting their strong, competitive position. In 1994, the United States regained the lead over Japan in gross annual sales of PV modules.*

14. c: *In 1994, more than 75% of the PV modules produced in the United States were exported, mostly to developing countries where 2 billion people still live without electricity.*

15. d: *(see above)*

Sources:

1. *Photovoltaics News, Photovoltaic Energy Systems, Inc., February 1994.*

2. *Photovoltaics Program Overview: Fiscal Year 1993, DOE, February 1994.*

3. *The Potential of Renewable Energy: An Interlaboratory White Paper, DOE, March 1990.*

4. *Photovoltaics Program Overview: Fiscal Year 1995, DOE, February 1996.*